

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service
Center for Coastal Fisheries and Habitat Research
101 Pivers Island Road
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***Comparative analysis of the functioning of disturbed and undisturbed
coral reef and seagrass ecosystems in the Tortugas:
Phase I- Establishing a baseline & Phase II- Measuring the effect of establishing a
reserve***

July 31, 2002

Cruise and Progress Report for Leg III of
NOAA Ship Ferrel Cruise FE-02-10-BL
24 April - 29 April 2002

Submitted By:

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July 31, 2002

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INTRODUCTION

In July 2001, the Tortugas Ecological Reserve was established. It includes two components: Tortugas North and Tortugas South (Figure 1). Tortugas North is approximately 151 nm² and covers the northern half of Tortugas Bank, Sherwood Forest, the pinnacle reefs north of the bank, and extensive low relief areas in the 15-40 m depth range. The latter low relief areas have received little assessment. Tortugas South is approximately 60 nm² and encompass Riley's Hump as well as deep water habitats to the south which are reported to provide critical habitat for several snapper species, snowy grouper, tilefish, and golden crab. The

implementation of this reserve has provided an excellent opportunity for NOAA to investigate the effects of human disturbance (e.g., elimination of consumptive sampling and physical impacts) on the functioning of coral reef and deepwater algal and seagrass ecosystems.

In support of this research, the NOAA Ship Ferrel arrived in Key West, FL on 24 April 2002 to support research objectives of the CCFHR and collaborators (CCMA, CSC, FMRI, NURC, USF) in the Dry Tortugas Ecological Reserve. A total of eight scientists representing three federal and state institutions and one Teacher-At-Sea participated. This was the seventh cruise in support of this mission.

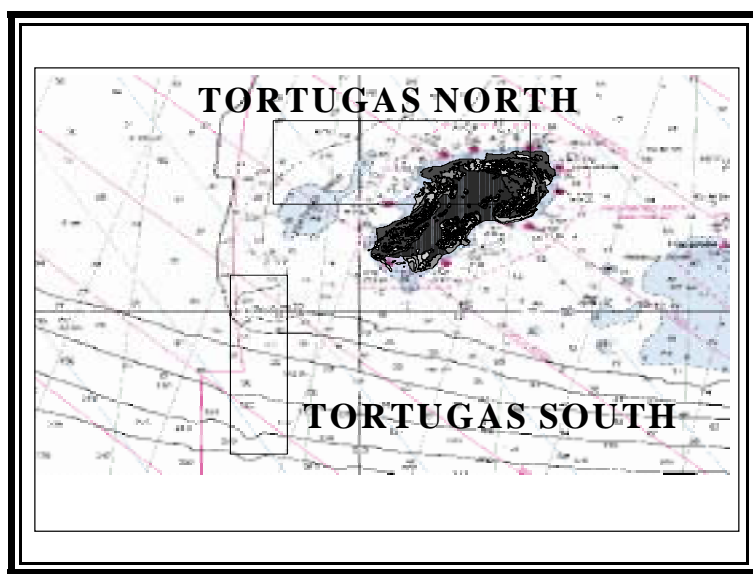


Figure 1. Boundaries of the Tortugas Ecological Reserve.

OBJECTIVES

Programmatic: Over the three year period of this work, we have proposed:

- 1) a preliminary characterization and inventory of the benthic habitat and fish communities in the extreme depths of the Tortugas South reserve component;
- 2) characterization of spawning aggregations and initiating the development of a probabilistic model of the fate of snapper larvae, focusing on Riley's Hump;
- 3) beginning comparative characterization of shallow and deepwater seagrass communities and their contribution to fishery resources in disturbed (outside the reserve) and undisturbed sites (inside the reserve);
- 4) establishment of a baseline for benthic nutrient composition and flux in disturbed and undisturbed sites;
- 5) determination of the accuracy of existing habitat delineations within the proposed ecological reserve as a function of depth and disturbed and undisturbed sites;
- 6) examination of how high resolution ecological data of a given habitat type can be scaled to the larger spatial context of the proposed ecological reserve.

Cruise FE-02-10-BL: Here, our objectives were to:

- 1) Begin Sport Scan® sidescan sonar transects at all 30 permanent stations (Figure 2, Appendix I). Maximum of two ~ 500 - 1000 m long parallel transects per station (Figure 3).
- 2) Conduct simultaneous towed video, QTC VIEW® sonar, and ROXANN® sonar transects at selected

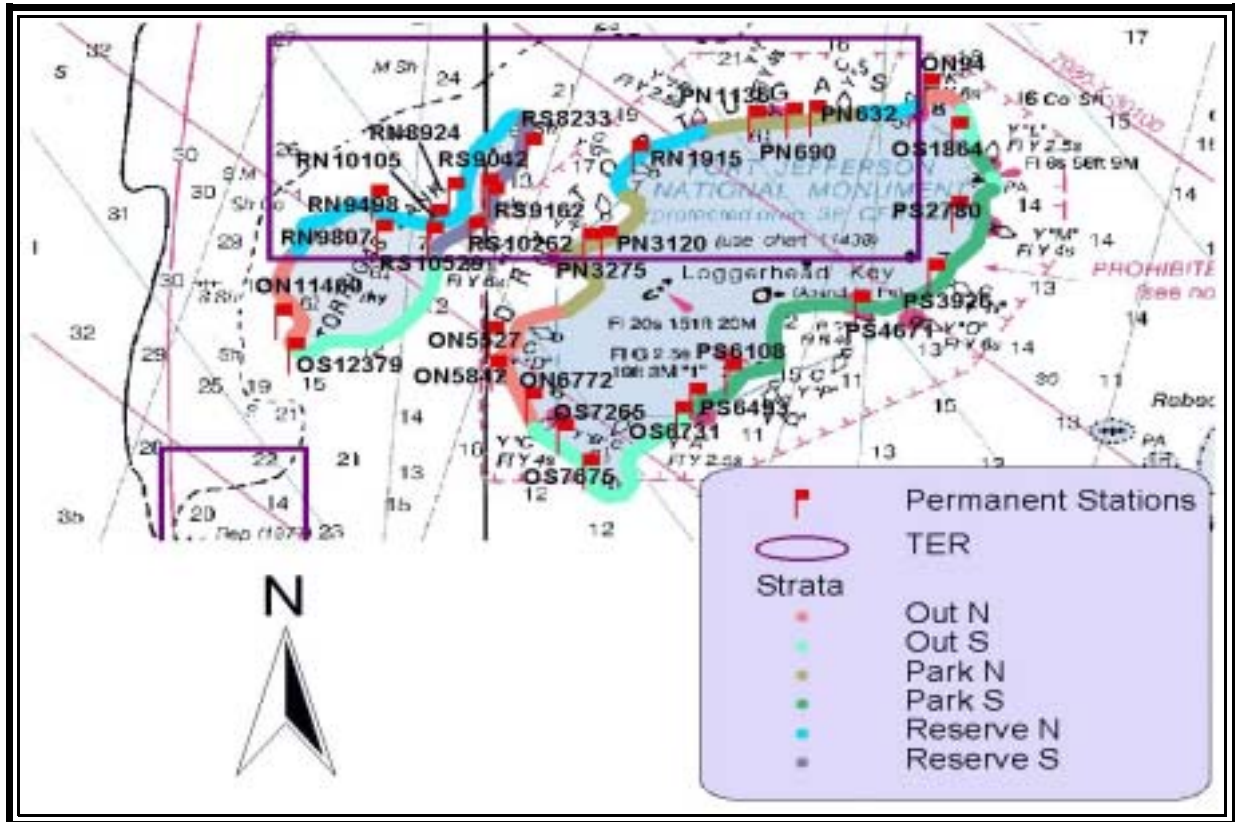


Figure 2. Locations of the thirty permanent stations.

permanent stations (Figure 2, Appendix I). Transect lengths and separation distances will vary but will typically be < 1 km.

3) Return to co-ordinate (24.81515333N, 82.87444333W) where deepwater seagrass was video recorded by the Deepworker manned submersible as part of the cruise aboard NOAA Ship GORDON GUNTER in July 2001. A series of sweeps will be made through this area with ROV to validate the presence of seagrass, to record a maximum depth of occurrence, and to possibly collect a grab sample of the grass via Ponar.

4) Conduct ground truthing for aerial photography using towed video around Dry Tortugas National Park (DTNP).

5) Conduct beam trawls, ROV drifts, and Ponar grabs within the area of the TER's northern boundary and at selected permanent plates (Figure 2, Appendix I).

6) Install coral settlement plates at selected stations.

Cruise Component: 24 April 2002
29 April 2002

Departed Key West, FL
Arrived Key West, FL

-video and sonar mapping along defined transects up to ~3 km length using QTC VIEW seafloor classification system, ROXANN sonar, Sport Scan sidescan sonar, and towed video; at select stations, deployed divers to establish temperature loggers at previously established permanent transects; conducted ground truthing for aerial photography using drop cameras; performed nightly beam trawls

Participants:

Name	Title	Affiliation
Mark Fonseca	Chief Scientist	NOS, Beaufort, NC
Amy Uhrin	Field Party Chief	NOS, Beaufort, NC
Craig Bonn	Chief Diver	NOS, Beaufort, NC
Donald Field	Geographer	NOS, Beaufort, NC
Christine Addison	Biological Technician	NOS, Beaufort, NC
Greg Piniak	Post-Doc	NOS, Beaufort, NC
Mark Finkbeiner	Geographer	NOS, Charleston, SC
Piper Moyer	Teacher-At-Sea	Jacksonville, FL
Beth Watkins	Ph.D. Student	University of Virginia

DRY TORTUGAS ECOLOGICAL RESERVE (NORTH)

Station Location and General Survey Work: Benthic mapping at selected permanent stations was conducted using the Sport Scan sidescan sonar system. In addition, the QTC VIEW seafloor classification system and ROXANN sonar unit were run simultaneously at selected stations in an attempt to synchronize these two systems, with verification of substrate characteristics via MiniBAT® TOV equipped with a downward facing video camera. Random points from the area around DTNP were selected for drop camera verification of substrate as a means of ground truthing aerial photography. Beam trawl samples were taken at selected stations along the northern boundary of the TER. Divers were deployed to establish temperature loggers at selected permanent stations. Twenty-two loggers were deployed. See the complete listing of all data/samples collected given in Appendix II for site locations of temperature loggers, beam trawls, ground truthing points, and sonar/video transects.

Approach (Specific): We continued with the sampling protocol that had been adopted beginning with the February 2001 cruise aboard NOAA Ship OREGON II (OT-01-01). To reiterate, based upon previous extensive habitat characterizations, six categories of habitat had been established: Out North (outside the reserve/park, north of the prevailing current) Out South (outside the reserve/park, south of the prevailing current), Park North (inside the park, north of the prevailing current), Park South (within the park, south of the prevailing current), Reserve North (within the reserve, north of the prevailing current), and Reserve South (within the reserve, south of the prevailing current; Figure 2). Five random sample points were selected from within each of the six categories (Figure 2). These 30 stations had been previously mapped during 2001 cruises (OT-01-01, FE-01-07-BL, FE-01-10-BL, and FE-01-11-BL) using the MiniBAT equipped with a vertically-mounted camera and QTC VIEW seafloor classification system. For this cruise, we began mapping the 30 permanent stations with a new unit, the Sport Scan, a sidescan sonar, which performed admirably at distances out to ~ 60m. A list of the 30 permanent stations is given in Appendix I (see also Figure 2).

Diving: Divers were deployed to establish temperature loggers at selected permanent stations. When the interface was not located at the specified mark, divers searched the area until the interface was located. Upon surfacing, a new mark was taken with a Trimble® Pro XR/XRS unit. Twenty dives were logged on this cruise, including some dives with divers breathing NITROX II. A complete listing of all dive statistics is presented in Appendix IV.

Beam Trawl: At select stations, we conducted 3-5 minute tows. Samples were initially preserved in formalin (24h) and then transferred to ethyl alcohol.

Drop Camera Drifts: At randomly selected stations along the northern boundary, drop camera drifts were made in an effort to capture a video record of trawl disturbance. Trawl tracks were evidenced on several occasions (Figure 4).

Ancillary Data: We recorded the GIS tracks of all tows, as well as drop camera searches and beam trawls. A complete listing of all data/samples collected is given in Appendix II (sample codes in Appendix III).

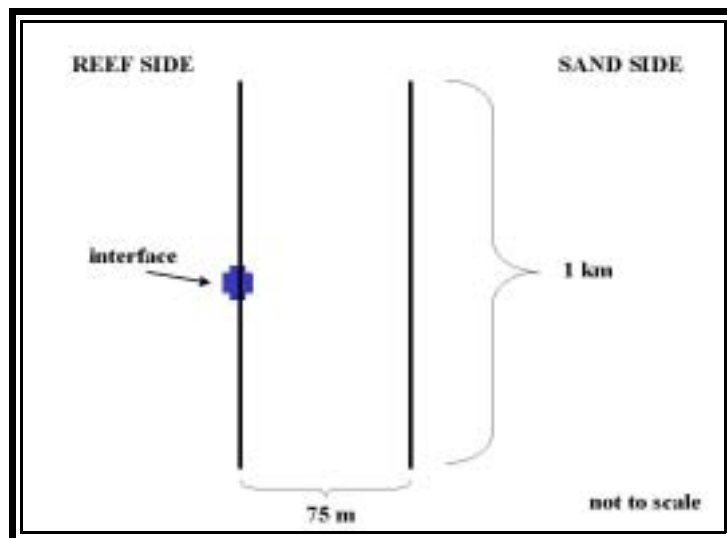


Figure 3. Sport Scan tow paths.



Figure 4. Parallel trawl tracks on the seafloor as viewed by the drop camera at the northern boundary of the TER in ~ 40m of water. Distance between tracks are ~ 15 cm.

APPENDIX I. Thirty permanent stations.

Station ID	Latitude	Longitude	Depth (ft)
RN1915	24.703150000	82.92815	100
RN9807	24.660900000	83.0467	63
RN10105	24.668816667	83.021566664	83
RN9498	24.683433333	83.013583333	75
RN8924	24.679250010	83.048716673	92
RS8233	24.706733333	82.97748333	104
RS9042	24.685183331	83.997466668	82
RS9162	24.680633333	82.995100001	87
RS10262	24.662299999	83.003666667	91
RS10529	24.659585389	83.023301312	85
ON5842	24.589099995	82.993966667	85
ON94	24.737799622	82.793482367	97
ON5527	24.607116670	82.994816667	100
ON6772	24.572633330	82.977850002	72
ON11460	24.616700000	83.093316667	79
OS1864	24.715007833	82.780514994	61
OS6731	24.564866183	82.908384117	80
OS7265	24.555500000	82.9628	79
OS7675	24.537416660	82.951066667	79
OS12379	24.598416667	83.08708333	103
PN632	24.723883994	82.846429714	96
PN690	24.722817989	82.856984239	97
PN1136	24.721195739	82.874649469	99
PN3120	24.657728508	82.942727	87
PN3275	24.656763525	82.950820475	96
PS2780	24.673361295	82.780903483	54
PS3926	24.640229853	82.791548761	68
PS4671	24.623451044	82.825840933	79
PS6108	24.587854058	82.885310917	72
PS6493	24.574495475	82.901414336	78

APPENDIX II. Sample log.

Date	Start Time	Station #	Strata	Sample Code	Latitude	Longitude
4/24/02	2004 UTC	8233	RS	SPORT		
4/24/02	2036 UTC	8233	RS	SPORT		
4/24/02	2220 UTC	8233	RS	SPORT		
4/24/02	1600 EST	8233	RS	WPT	24.7067333	82.9774833
4/24/02	1600 EST	8233	RS	DIVE	24.7067333	82.9774833
4/24/02	1600 EST	8233	RS	TEMP		
4/24/02	1600 EST	8233	RS	WPT	24 42.379	82 58.667
4/24/02	1600 EST	8233	RS	WPT	24 42.399	82 58.673
4/24/02	1600 EST	8233	RS	WPT	24 42 22.6077	82 58 40.79134
4/24/02	2300 UTC	9498	RN	SPORT		
4/24/02	2323 UTC	9498	RN	SPORT		
4/24/02	2035 EST	northern boundary west	inside	WPT	24.7496260	83.0499810
4/24/02	2035 EST	northern boundary west	inside	BEAM	24.7514479	83.0482806
4/24/02	2035 EST	northern boundary west	inside	ASP	24.7514479	83.0482806
04/25/02				TRUTH/DROP	24.6278737	82.9475151
04/25/02				TRUTH/DROP	24.6213521	82.9456748
04/25/02				TRUTH/DROP	24.6250604	82.9444542
04/25/02				TRUTH/DROP	24.6182587	82.9389282
04/25/02				TRUTH/DROP	24.6277417	82.9286912
04/25/02				TRUTH/DROP	24.6257557	82.9340829
04/25/02				TRUTH/DROP	24.6206580	82.9430854
4/25/02	0822 EST	9807	RN	WPT	24.6609000	83.0467000
4/25/02	0822 EST	9807	RN	DIVE	24.6609000	83.0467000
4/25/02	0822 EST	9807	RN	TEMP	24.6609000	83.0467000

4/25/02	0946 EST	11460	ON	WPT	24.6167000	83.0933167
4/25/02	0946 EST	11460	ON	DIVE	24.6167000	83.0933167
4/25/02	0946 EST	11460	ON	TEMP	24.6167000	83.0933167
4/25/02	12:40:42 UTC			ROX		
4/25/02	1:44:48 UTC			ROX		
4/25/02		near 3275	PN	QTC		
4/25/02	1305 EST	near 3275	PN	ASP	24.6565040	82.9566318
4/25/02	~1700 UTC	near 3275	PN	SVHS		
4/25/02		near 3275	PN	QTC		
4/25/02		near 3275	PN	QTC		
4/25/02	1308 EST	near 3275	PN	ASP	24.6530051	82.9537398
4/25/02		near 3275	PN	QTC		
4/25/02		near 3275	PN	QTC		
4/25/02		near 3275	PN	QTC		
4/25/02	1455 EST	near 3275	PN	ASP	24.6446515	82.9460428
4/25/02		near 3275	PN	QTC		
4/25/02		near 3275	PN	QTC		
4/25/02		near 3275	PN	QTC		
4/25/02		near 3275	PN	QTC		
4/25/02	1512 EST	near 3275	PN	ASP	24.6552883	82.9566398
4/25/02				QTC		
4/25/02	1325 EST	1915	RN	WPT	24.7031500	82.9281500
4/25/02	1325 EST	1915	RN	DIVE	24.7031500	82.9281500
4/25/02	1325 EST	1915	RN	WPT	24 42 08.50957	82 55 44.72453
4/25/02	1325 EST	1915	RN	WPT	24 42 05.03408	82 55 49.56082
4/25/02	1325 EST	1915	RN	WPT	24 42 04.96052	82 55 49.96435
4/25/02	1325 EST	1915	RN	TEMP		
4/25/02	21:10 UTC	1915	RN	SPORT		

4/25/02	1710 EST	1915	RN	ASP	24.6985656	82.9334536
4/25/02	20:20 UTC	1915	RN	SPORT		
4/25/02	2151 UTC	1915	RN	SPORT		
4/25/02	1747 EST	1915	RN	ASP	24.6986695	82.9341358
4/25/02		northern boundary west	outside	WPT	24.7845890	83.0486881
4/25/02		northern boundary west	outside	ROV		
4/25/02	2015 EST	northern boundary west	outside	ASP	24.7860072	83.0455406
4/25/02	2030 EST	northern boundary west	outside	ASP	24.7877703	83.0514646
4/25/02	2030 EST	northern boundary west	outside	WPT	24.7845890	83.0486881
4/25/02	2052 EST	northern boundary west	outside	BEAM	24.7919564	83.0560566
4/25/02	2052 EST	northern boundary west	outside	ASP	24.7919564	83.0560566
4/25/02	2140 EST	northern boundary mid	outside	WPT	24.7844312	82.9651262
4/25/02	2140 EST	northern boundary mid	outside	BEAM	24.7856149	82.9648909
4/25/02	2140 EST	northern boundary mid	outside	ASP	24.7856149	82.9648909
04/26/02				TRUTH/DROP	24.6292593	82.8859232
04/26/02				TRUTH/DROP	24.6078801	82.8902468
04/26/02				TRUTH/DROP	24.6073932	82.8876769
04/26/02				TRUTH/DROP	24.6122925	82.8790589
04/26/02				TRUTH/DROP	24.6087374	82.8848786
04/26/02				TRUTH/DROP	24.6154086	82.8878180
04/26/02				TRUTH/DROP	24.6178280	82.8940811
04/26/02				TRUTH/DROP	24.6225731	82.8945951
04/26/02				TRUTH/DROP	24.6275152	82.8908690
04/26/02				TRUTH/DROP	24.6341908	82.8665864
04/26/02				TRUTH/DROP	24.6329202	82.8656687
04/26/02				TRUTH/DROP	24.6147052	82.8806909
04/26/02				TRUTH/DROP	24.6221809	82.8952736
04/26/02				TRUTH/DROP	24.6248038	82.8673990
4/26/02	0829 EST	5842	ON	WPT	24.5891000	82.9939667
4/26/02	0829 EST	5842	ON	DIVE	24.5891000	82.9939667

4/26/02	0829 EST	5842	ON	WPT	24 35 20.66076	82 59 37.80587
4/26/02	0829 EST	5842	ON	TEMP	24 35 20.66076	82 59 37.80587
4/26/02	0954 EST	7675	OS	WPT	24.5374167	82.9510667
4/26/02	0954 EST	7675	OS	DIVE	24.5374167	82.9510667
4/26/02	0954 EST	7675	OS	WPT	24 32 14.51495	82 57 03.56795
4/26/02	0954 EST	7675	OS	TEMP	24 32 14.51495	82 57 03.56795
4/26/02	13:43:08 UTC	5842	ON	ROX		
4/26/02	21:35:10 UTC	5842	ON	ROX		
4/26/02	1707 UTC	5842	ON	SPORT		
4/26/02	1306 EST	5842	ON	ASP	24.5970371	82.9941421
4/26/02	1733 UTC	5842	ON	SPORT		
4/26/02	1333 EST	5842	ON	ASP	24.5842674	82.9938808
4/26/02	1856 UTC	7675	OS	SPORT		
4/26/02	1455 EST	7675	OS	ASP	24.5326908	82.9504460
4/26/02	1934 UTC	7675	OS	SPORT		
4/26/02	1534 EST	7675	OS	ASP	24.5309634	82.9484370
4/26/02	1737 EST	monument area		ASP	24.6818911	82.8777651
4/26/02		monument area		BAT		
4/26/02		monument area		SVHS		
4/26/02		monument area		QTC		
4/26/02		monument area		QTC		
4/26/02	2004 EST	northern boundary mid	inside	DROP	24.7506410	82.9723486
4/26/02	2004 EST	northern boundary mid	inside	ASP	24.7506410	82.9723486
4/26/02	2004 EST	northern boundary mid	inside	SVHS	24.7506410	82.9723486
4/26/02	2004 EST	northern boundary mid	inside	DV	24.7506410	82.9723486

4/26/02		northern boundary east	inside	DROP	24.7481329	82.8738917
4/26/02	2146 EST	northern boundary east	inside	ASP	24.7481329	82.8738917
4/26/02		northern boundary east	inside	SVHS	24.7481329	82.8738917
4/26/02		northern boundary east	inside	DV	24.7481329	82.8738917
4/26/02		northern boundary mid	inside	WPT	24.7494735	82.9659760
4/26/02	2049 EST	northern boundary mid	inside	BEAM	24.7515141	82.9727315
4/26/02	2049 EST	northern boundary mid	inside	ASP	24.7515141	82.9727315
4/26/02		northern boundary east	inside	WPT	24.7473852	82.8716592
4/26/02	2221 EST	northern boundary east	inside	BEAM	24.7463031	82.8730297
4/26/02	2221 EST	northern boundary east	inside	ASP	24.7463031	82.8730297
04/27/02				TRUTH/DROP	24.7136655	82.7951482
04/27/02				TRUTH/DROP	24.6921326	82.8411846
04/27/02				TRUTH/DROP	24.6887424	82.8452327
04/27/02				TRUTH/DROP	24.6943606	82.8170572
04/27/02				TRUTH/DROP	24.6947707	82.8036400
04/27/02				TRUTH/DROP	24.6958478	82.8045410
04/27/02				TRUTH/DROP	24.6967850	82.8029654
04/27/02				TRUTH/DROP	24.7053240	82.7906948
4/27/02	0850 EST	Texas Rocks		WPT	24 40.810	82 53.180
4/27/02	0850 EST	Texas Rocks		DIVE	24 40.810	82 53.180
4/27/02	0850 EST	Texas Rocks		WPT	24 40 48.30853	82 53 10.08259
4/27/02	0850 EST	Texas Rocks		TEMP	24 40 48.30853	82 53 10.08259
4/27/02	1136 EST	Pulaski Shoal		WPT	24 41.661	82 46.296
4/27/02	1136 EST	Pulaski Shoal		DIVE	24 41.661	82 46.296
4/27/02	1136 EST	Pulaski Shoal		WPT	24.6941200	82.7724700
4/27/02	0918 EST	monument area		BAT		
4/27/02	0918 EST	monument area		ASP	24.6882844	82.8738178

4/27/02	1317					
4/27/02	UTC	monument area	SVHS			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02	0905					
4/27/02	EST	monument area	ASP			
4/27/02	1406					
4/27/02	UTC	monument area	SVHS			
4/27/02	1206					
4/27/02	EST	monument area	ASP	24.6795477	82.8708642	
4/27/02	1607					
4/27/02	UTC	monument area	SVHS			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02	1629					
4/27/02	UTC	monument area	SVHS			
4/27/02	1316					
4/27/02	EST	monument area	ASP	24.6737586	82.8664154	
4/27/02	1717					
4/27/02	UTC	monument area	SVHS			
4/27/02	1318					
4/27/02	EST	monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
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4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02		monument area	QTC			
4/27/02	17:53:02					
4/27/02	UTC	monument area	ROX			

4/27/02		monument area		QTC		
4/27/02	1417					
4/27/02	EST	monument area		ASP	24.6726800	82.8281010
4/27/02		monument area		QTC		
4/27/02		northern boundary				
		east	outside	QTC		
4/27/02	2114	northern boundary				
4/27/02	EST	east	outside	ASP	24.7872972	82.8770640
4/27/02		northern boundary				
		east	outside	WPT	24 47.0045444	82 52.2338584
4/27/02	2043	northern boundary				
4/27/02	EST	east	outside	DROP	24.7842154	82.8743768
4/27/02	2043	northern boundary				
4/27/02	EST	east	outside	DV	24.7842154	82.8743768
4/27/02	2043	northern boundary				
4/27/02	EST	east	outside	VHS	24.7842154	82.8743768
4/27/02	2043	northern boundary				
4/27/02	EST	east	outside	ASP	24.7842154	82.8743768
4/27/02		northern boundary				
		east	outside	WPT	24 47.0045444	82 52.2338584
4/27/02	2129	northern boundary				
4/27/02	EST	east	outside	BEAM	24.7827065	82.8741097
4/27/02	2129	northern boundary				
4/27/02	EST	east	outside	ASP	24.7827065	82.8741097
4/27/02		northern boundary				
		east	interface	WPT	24.7666793	82.8713481
4/27/02	2216	northern boundary				
4/27/02	EST	east	interface	DROP	24.7693932	82.8738652
4/27/02	2216	northern boundary				
4/27/02	EST	east	interface	DV	24.7693932	82.8738652
4/27/02	2216	northern boundary				
4/27/02	EST	east	interface	VHS	24.7693932	82.8738652
4/27/02	2216	northern boundary				
4/27/02	EST	east	interface	ASP	24.7693932	82.8738652
4/27/02		northern boundary				
		east	interface	WPT	24.7666793	82.8713481
4/27/02	2154	northern boundary				
4/27/02	EST	east	interface	BEAM	24.7661951	82.8732157
4/27/02	2154	northern boundary				
4/27/02	EST	east	interface	ASP	24.7661951	82.8732157
04/28/02				TRUTH/DROP	24.6199699	82.9208874
04/28/02				TRUTH/DROP	24.6205102	82.9227652
04/28/02				TRUTH/DROP	24.6361874	82.9042698
04/28/02				TRUTH/DROP	24.6372451	82.9042365
04/28/02				TRUTH/DROP	24.6352238	82.9042918
04/28/02				TRUTH/DROP	24.6358637	82.9018114

04/28/02			TRUTH/DROP	24.6201538	82.9216852
04/28/02			TRUTH/DROP	24.6207047	82.9232926
04/28/02			TRUTH/DROP	24.6156648	82.9243097
04/28/02			TRUTH/DROP	24.6046030	82.9009049
04/28/02			TRUTH/DROP	24.6031133	82.8984789
04/28/02			TRUTH/DROP	24.6047456	82.8974094
	~0920				
4/28/02	EST	monument area	BAT		
	0817				
4/28/02	EST	monument area	ASP		
	1323				
4/28/02	EST	monument area	SVHS		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
	~0920				
4/28/02	EST	monument area	BAT		
	1056				
4/28/02	EST	monument area	ASP		
	1551				
4/28/02	UTC	monument area	SVHS		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
	1638				
	UTC	monument area	SVHS		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
4/28/02		monument area	QTC		
	1246				
4/28/02	EST	monument area	ASP		
	1746				
4/28/02	UTC	monument area	SVHS		
	16:23:00				
4/28/02	UTC	monument area	ROX		
	17:35:58				
4/28/02	UTC	monument area	ROX		
4/28/02		monument area	QTC		

4/28/02	1353 EST	monument area	ASP		
4/28/02		monument area	QTC		
4/28/02	1407 EST	monument area	ASP		
4/28/02		monument area	QTC		
4/28/02	1907 UTC	monument area	SVHS		
4/28/02	18:53:28 UTC	monument area	ROX		
4/28/02		monument area	SPORT		
4/28/02	1624 EST	monument area	ASP	24.6639879	82.8668269
4/28/02	1714 EST	monument area	ASP	24.6635658	82.8704770
4/28/02	21:16:00 UTC	monument area	QTC		
4/28/02	21:16:00 UTC	monument area	SVHS		
4/28/02	12:26:56 UTC	monument area	QTC		
4/28/02	21:33:23 UTC	monument area	SVHS		
4/28/02	21:14:14 UTC	monument area	ROX		
4/28/02	22:03:20 UTC	monument area	SPORT		
4/28/02	1700 EST	monument area	ASP		
4/28/02		monument area	QTC		
4/28/02	22:53:41 UTC	monument area	ROX		
4/28/02	0:21:19 UTC	monument area	ROX		
4/28/02	22:56:10 UTC	monument area	QTC		
4/28/02	22:56:10 UTC	monument area	ASP		
4/28/02	22:56:10 UTC	monument area	SVHS		
4/28/02		northern boundary west interface	WPT	24.7683001	83.0499484
4/28/02	2050 EST	northern boundary west interface	DROP	24.7681712	83.0516348
4/28/02	2050 EST	northern boundary west interface	DV	24.7681712	83.0516348

4/28/02	2050 EST	northern boundary west	interface	VHS	24.7681712	83.0516348
4/28/02	2050 EST	northern boundary west	interface	ASP	24.7681712	83.0516348
4/28/02		northern boundary west	interface	WPT	24.7683001	83.0499484
4/28/02	2118 EST	northern boundary west	interface	BEAM	24.7670394	83.0526973
4/28/02	2118 EST	northern boundary west	interface	ASP	24.7670394	83.0526973
4/28/02		northern boundary mid	interface	WPT	24.7676416	82.9655469
4/28/02	2225 EST	northern boundary mid	interface	DROP	24.7711001	82.9659854
4/28/02	2225 EST	northern boundary mid	interface	DV	24.7711001	82.9659854
4/28/02	2225 EST	northern boundary mid	interface	VHS	24.7711001	82.9659854
4/28/02	2225 EST	northern boundary mid	interface	ASP	24.7711001	82.9659854
4/28/02	2118 EST	northern boundary mid	interface	BEAM	24.7673541	82.9663476
4/28/02	2206 EST	northern boundary mid	interface	ASP	24.7673541	82.9663476
4/29/02	0801 EST	9498	RN	WPT	24.6792500	83.0487167
4/29/02	0801 EST	9498	RN	DIVE	24.6792500	83.0487167
4/29/02	0801 EST	9498	RN	WPT	24 40 46.54126	83 02 56.00513
4/29/02	0801 EST	9498	RN	TEMP	24 40 46.54126	83 02 56.00513
4/29/02	0930 EST	9498	RN	SPORT		
4/29/02	0942 EST	9498	RN	ASP	24.6792555	83.0477591

APPENDIX III. Sample codes.

ASPEN file	ASP
beam trawl	BEAM
benthic chl	CHL_BEN
bongo tow	BONG
Braun Blanquet	BB
coral recruitment	RECRUIT
CTD	CTD
drifter	DRIFT
drop camera	DROP
fish video transect	FVT
fish visual census	FVC
ground truth point	TRUTH
habitat video	HABTRAN
herbivory	
downrigger	HERB
light profile	
(continuous)	LGT_CONT
light profile	
(stationary)	LGT_STAT
MiniBat tow	BAT
PONAR grab	PONAR
QTC view	QTC
regular VHS video	VHS
ROV	ROV
ROXANN	ROX
SCUBA seine	SS
Secchi disk	SEC
sediment particle	
size	SED_PART
sediment	
penetration	SED_PEN
sediment torque	SED_TRQ
seed cores	SEED
Smith-Mac grab	SMAC
Sport Scan	SPORT
stable isotope	
phytoplankton	SI_PHYT
fish	SI_FISH
inverte	SI_INV
macroalgae	SI_MAC
benthic	
microalgae	SI_MIC

	seagrass	SI_SG
	coral	SI_COR
Super VHS video		SVHS
temperature logger		TEMP
Tucker trawl		TUCK
video sled		SLED
water column chl		CHL_COL
water column		
nutrients		NUT_COL
waypoint		WPT

APPENDIX IV. Dive statistics.

DIVER NAME	DATE	% O2	DEPTH	Actual Bottom Time
C Bonn	4/24/02	36	110	27
G Piniak	4/24/02	36	110	27
D Field	4/25/02	21	60	35
C Addison	4/25/02	21	61	35
A Uhrin	4/25/02	21	81	30
M Fonseca	4/25/02	21	79	30
C Bonn	4/25/02	36	99	23
G Piniak	4/25/02	36	97	23
C Bonn	4/26/02	36	86	25
G Piniak	4/26/02	36	84	25
M Fonseca	4/26/02	36	79	36
C Addison	4/26/02	36	79	35
A Uhrin	4/27/02	21	52	34
G Piniak	4/27/02	21	50	33
C Bonn	4/27/02	21	48	39
C Addison	4/27/02	21	48	39
A Uhrin	4/29/02	36	78	43
G Piniak	4/29/02	36	76	42
D Field	4/29/02	32	78	40
C Bonn	4/29/02	32	77	41

